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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/562,620	KOPMEINERS ET AL.	
	Examiner	Art Unit	
	Candal Elpenord	2616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 May 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 December 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *22 December 2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. **Claims 1-3, 5-18, 20-25** are rejected under 35 U.S.C. 102(e) as being anticipated by Li et al (US 2003/0016621 A1).

Regarding claim 1, Li et al. discloses a method for transmitting data ("**transmission of training symbols", recited in paragraph 0007**) in a multiple antenna communication system (**fig. 1**, **Transmission System 100, recited in paragraph 0021**) having N transmit antennas (**fig. 1, OFDM Antennas 120-1, 120-2, 130-1, recited in paragraph 0021**), said method ("**transmission of training symbols", recited in paragraph 0007**) comprising the step of: transmitting a legacy preamble ("**transmission of synch symbol that allows receiver to extract data from the signal**", **recited in paragraph 0036-synch symbol plays the accomplishes the same function as that of a preamble**) having at least one long training symbol (**fig. 3, Training symbols 320, recited in paragraph 0035**) and at least one additional long training symbol (Fig. 3, Data Symbols 330, recited in paragraph 0035) on each of said N transmit antennas (**fig. 1, OFDM Antennas 120-1, 120-2, 130-1, recited in paragraph**

0021), wherein a sequence ("**training sequences", recited in paragraphs 0052-0053**) of each of said long training symbols (**fig. 3, Training Symbols, recited in paragraph 0035-0036**) on each of said N transmit antennas (**fig. 1, OFDM Antennas 120-1, 120-2, 130-1, recited in paragraph 0021**) are orthogonal (**fig. 2, "individual sub-bands with spaced frequency", recited in paragraph 0035**-since there is space between each sub-band, it's orthogonal) .

Regarding claim 2, Li et al. discloses the method ("**transmission of training symbols", recited in paragraph 0007**), wherein said legacy preamble ("**transmission of synch symbol that allows receiver to extract data from the signal", recited in paragraph 0036-synch symbol plays the accomplishes the same function as that of a preamble**) further comprises at least one short training symbol (**fig. 3, Guard Symbols 340, recited in paragraphs 0035-0036**).

Regarding claim 3, Li et al. discloses the method ("**transmission of training symbols", recited in paragraph 0007**), wherein said legacy preamble ("**transmission of synch symbol that allows receiver to extract data from the signal", recited in paragraph 0036-synch symbol plays the accomplishes the same function as that of a preamble**) further comprises at least one SIGNAL field (**fig. 3, Communication signal 300**, comprising of "**synch symbols, number of data symbols", recited in paragraph 0035, lines 6-12**).

Regarding claim 5, Li et al. discloses the method ("**transmission of training symbols", recited in paragraph 0007**), wherein each of said long training symbols (fig.

3, Training Symbols, recited in paragraph 0035-0036) are time orthogonal ("replication of guard symbol sub-stream N times", recited in paragraphs 0042-0043).

Regarding claim 6, Li et al. discloses the method (**"transmission of training symbols", recited in paragraph 0007**), wherein each of said long training symbols (**fig. 3, Training Symbols, recited in paragraph 0035-0036**) are time orthogonal ("replication of guard symbol sub-stream N times", recited in paragraphs 0042-0043) by introducing a phase shift (**"shifted of phases in different regions", recited in paragraphs 0060-0063**) to each of said long training symbols (**fig. 3, Training Symbols, recited in paragraph 0035-0036**) relative to one another ("training sequences of different antennas", recited in paragraph 0063).

Regarding claim 7, Li et al. discloses the method (**"transmission of training symbols", recited in paragraph 0007**), wherein said phase shift ("shifted of phases in different regions", recited in paragraphs 0060-0063) is introduced to each of said long training symbols (fig. 3, Training Symbols, recited in paragraph 0035-0036) using a complex rotation ("transmitters in turn, modulate blocks of symbols in to electromagnetic carriers", recited in paragraph 0022, "frequency shift", recited in paragraph 0037).

Regarding claim 8, Li et al. discloses the method (**"transmission of training symbols", recited in paragraph 0007**), wherein N is two (fig. 1, see "OFDM Trasmitter130-1, 130-2, recited in paragraphs0021-0022-where N is the number of transmitters) and wherein said transmitting step further comprises the step of transmitting a legacy preamble (**"transmission of synch symbol that allows receiver to extract data from the signal", recited in paragraph 0036-synch symbol plays the**

accomplishes the same function as that of a preamble) having at least one long training symbol (fig. 3, Training symbols 320, recited in paragraph 0035) and one additional long training symbol (Fig. 3, Data Symbols 330, recited in paragraph 0035) on each of said two transmit antennas, wherein one (fig. 1, OFDM Antenna 120-1, recited in paragraph 0021) of said transmit antennas (**fig. 1, OFDM Antennas 120-1, 120-2, 130-1, recited in paragraph 0021**) transmits one ("**transmission of training symbols", recited in paragraph 0007**), of said long training symbols (fig. 3, Training Symbols, recited in paragraph 0035-0036) with a reversed polarity ("propagation of signal from the receiver to OFDM transmitter", recited in paragraphs 0023-0024).

Regarding claim 9, Li et al. discloses. the method ("**transmission of training symbols", recited in paragraph 0007**), whereby a lower order receiver (fig. 1, OFDM Receiver 150-1, recited in paragraph 0022, lines 8-17) can interpret said transmitted data ("**extraction of symbols from the digitized base-band signals", recited in paragraph 0022**).

Regarding claim 10, Li et al. discloses the method ("**transmission of training symbols", recited in paragraph 0007**), further comprising the step of transmitting a field indicating said number N of transmit antennas ("number of antennas where k denote sub-bands of a particular OFDM", recited in paragraphs 0028-0032).

Regarding claim 11, Li et al. discloses the method ("**transmission of training symbols", recited in paragraph 0007**), further comprising the step of transmitting a field identifying ("**communication signal 300", recited in paragraph 0039**) an

employed coding scheme ("**BPSK, QPSP, OPSK and FSK as the coding scheme", recited in paragraph 0039**).

Regarding claim 12, Li et al. discloses the method ("**transmission of training symbols", recited in paragraph 0007**), further comprising the step of transmitting a field identifying channel bonding options (fig. 4, Combining Circuits 450, recited in paragraphs 0040-0043, "transmitter/receiver pair to produce a complex communication channel", recited in paragraph 0024-0025).

Regarding claim 13, Li et al. discloses the method ("**transmission of training symbols", recited in paragraph 0007**), further comprising the step of transmitting a field identifying a long training symbol format ("K block with a number of patterns of training symbols", recited in paragraph 0044).

Regarding claim 14, Li et al. discloses the method ("transmission of training symbols", recited in paragraph 0007), wherein said legacy preamble ("**transmission of synch symbol that allows receiver to extract data from the signal", recited in paragraph 0036-synch symbol plays the accomplishes the same function as that of a preamble**) has a shorter guard interval (fig. 2, see "space between the sub-carriers, recited in paragraph 0035).

Regarding claim 15, Li et al. discloses the method ("transmission of training symbols", recited in paragraph 0007), wherein said legacy preamble ("**transmission of synch symbol that allows receiver to extract data from the signal", recited in paragraph 0036-synch symbol plays the accomplishes the same function as that**

of a preamble) has a long training field ("transmitting of K blocks of symbols as burst", recited in paragraphs 0045-0046) containing only one long training symbol ("K block with streams of symbols", recited in paragraphs 0045-0046).

Regarding claim 16, a transmitter (**fig. 1, Transmitter 130-1, recited in paragraph 0021**) in a multiple antenna communication system (**fig. 1, Transmission System 100, recited in paragraph 0021**), comprising: N transmit antennas (**fig. 1, OFDM Antennas 120-1, 120-2, 130-1, recited in paragraph 0021**) for transmitting a legacy preamble ("**transmission of synch symbol that allows receiver to extract data from the signal**", **recited in paragraph 0036-synch symbol plays the accomplishes the same function as that of a preamble**) having at least one long training symbol (**fig. 3, Training symbols 320, recited in paragraph 0035**) and at least one additional long training symbol (fig. 3, Training Symbols 320, 330, recited in paragraphs 0035-0038) on each of said N transmit antennas (**fig. 1, OFDM Antennas 120-1, 120-2, 130-1, recited in paragraph 0021**), wherein each of said long training symbols (**fig. 3, Training Symbols, recited in paragraph 0035-0036**) are orthogonal **fig. 2, "individual sub-bands with spaced frequency", recited in paragraph 0035**- since there is space between each sub-band, it's orthogonal) .

Regarding claim 22, the transmitter (**fig. 1, Transmitter 130-1, recited in paragraph 0021**), wherein each of said time orthogonal long training symbols transmitted (**fig. 3, Training Symbols, recited in paragraph 0035-0036**) are stored in memory (**fig. 5, System Memory 520, "stores of the N sets of training symbols" recited in paragraph 0048-0049**) and said phase shift is introduced ("**shifted of**

phases in different regions", recited in paragraphs 0060-0063) when said long raining symbols are transmitted (**fig. 3, Training Symbols, recited in paragraph 0035-0036**).

Regarding claim 17-18, 20-21, 23-25 are rejected for the same reasons as their corresponding method claims.

3. **Claims 26, 29** are rejected under 35 U.S.C. 102(e) as being anticipated by Ma et al (US 2003/007255 A1).

Regarding claim 26, Ma et al. discloses a method ("MIMO Transmitter transmitting header symbol and preamble", recited in paragraph 0017, 0025) for receiving data ("adapted to receive from a transmitter", recited in paragraph 0030-0031) on at least one receive antenna (fig. 7A, Receiver 734, recited in paragraph 0130, lines 1-14) transmitted by a transmitter (fig. 6, OFDM Transmitter 10, recited in paragraph 0124, lines 1-16) having N transmit antennas (fig. 6, Transmit antennas 21, 23, recited in paragraph 0124, lines 1-20) in a multiple antenna communication system (fig. 6, fig. 7A, MIMO OFDM Transmitter, recited in paragraphs 0124, 0130), said method ("MIMO Transmitter transmitting header symbol", recited in paragraph 0017) comprising the steps of: receiving a legacy preamble ("received of a transmitted preamble by a transmitter", recited in paragraphs 0021, 0030-0031) having at least one long training symbol ("OFDM supperframe with OFDM symbols", recited in paragraphs 0033, fig. 2A-B, Supperframe 500, recited in paragraphs 0106-0107, "receiving training sequence", recited in paragraphs 0071-0073) and an indication of a duration ("supperframe duration

of on second", recited in paragraphs 0106-0107) of a transmission of said data ("transmission of frame", recited in paragraph 0033), and at least one additional long training symbol (fig. 2A-2B, second "Supper frame 500, recited in paragraphs 0106-0107) on each of said N transmit antennas (fig. 6, Transmit antennas 21, 23, recited in paragraph 0124, lines 1-20), wherein a sequence ("repeating sequence of OFDM symbols", recited in paragraphs 0028-0029, fig. 2A-2B, see "sequence of OFDM frames", recited in paragraphs 0107-0109) of each of said long training symbols ("OFDM supperframe with OFDM symbols", recited in paragraphs 0033, fig. 2A-B, Supperframe 500, recited in paragraphs 0106-0107) on each of said N transmit antennas (fig. 6, Transmit antennas 21, 23, recited in paragraph 0124, lines 1-20) are orthogonal ("different set of sub-carriers for each set of antennas", recited in paragraphs 0017-0018), said legacy preamble transmitted ("transmitted preamble by the transmitter", recited in paragraph 0026-0027) such that said indication of a duration ("producing set of time domain samples for three OFDM duration", recited in paragraph 0052) can be interpreted ("sampling of received signals to produced a respective of time domain samples", recited in paragraph 0039-0040) by a lower order receiver (fig. 7A, Receiver 735, recited in paragraph 0130, lines 1-20) ; and deferring for said indicated duration ("frame signaling parameter with duration that allows user to determine data", recited in paragraph 0108-0109, "frame corresponding to modulation period", recited in col. 12, lines :).

Regarding claim 29, a receiver (fig. 7A, Receiver 734, recited in paragraph 0130, lines 1-14) in a multiple antenna communication system (fig. 6, fig. 7A, MIMO

OFDM Transmitter, recited in paragraphs 0124, 0130) having at least one transmitter (fig. 6, OFDM Transmitter 10, recited in paragraph 0124, lines 1-16) having N transmit antennas (fig. 6, Transmit antennas 21, 23, recited in paragraph 0124, lines 1-20), comprising: at least one receive antenna (fig. 7A, Receiver 734, recited in paragraph 0130, lines 1-14) for receiving a legacy preamble ("received of a transmitted preamble by a transmitter", recited in paragraphs 0021, 0030-0031) having at least one long training symbol ("OFDM supperframe with OFDM symbols", recited in paragraphs 0033, fig. 2A-B, Supperframe 500, recited in paragraphs 0106-0107, "receiving training sequence", recited in paragraphs 0071-0073) and an indication of a duration ("supperframe duration of on second", recited in paragraphs 0106-0107) of a transmission of said data ("transmission of frame", recited in paragraph 0033), and at least one additional long training symbol (fig. 2A-2B, second "Supper frame 500, recited in paragraphs 0106-0107) on each of said N transmit antennas (fig. 6, Transmit antennas 21, 23, recited in paragraph 0124, lines 1-20), wherein a sequence ("repeating sequence of OFDM symbols", recited in paragraphs 0028-0029, fig. 2A-2B, see "sequence of OFDM frames", recited in paragraphs 0107-0109) of each of said long training symbols ("OFDM supperframe with OFDM symbols", recited in paragraphs 0033, fig. 2A-B, Supperframe 500, recited in paragraphs 0106-0107, "OFDM symbols with training sequence", recited in paragraph 0071-0073) on each of said N transmit antennas (fig. 6, Transmit antennas 21, 23, recited in paragraph 0124, lines 1-20), are orthogonal ("different set of sub-carriers for each set of antennas", recited in paragraphs 0017-0018), said legacy preamble transmitted ("transmitted preamble by the

transmitter", recited in paragraph 0026-0027) such that said indication of a duration ("producing set of time domain samples for three OFDM duration", recited in paragraph 0052) can be interpreted ("sampling of received signals to produced a respective of time domain samples", recited in paragraph 0039-0040) by a lower order receiver (fig. 7A, Receiver 735, recited in paragraph 0130, lines 1-20); and means for deferring for said indicated duration("frame signaling parameter with duration that allows user to determine data", recited in paragraph 0108-0109, "frame corresponding to modulation period", recited in col. 12, lines).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. **Claims 4, 19** are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al (US 2003/0016621 A1) in view of Liu et al (US 2004/0208115 A1).

Regarding claim 4, Li et al. discloses the method ("**transmission of training symbols", recited in paragraph 0007**), **regarding claim 19**, the transmitter (**fig. 1, OFDM Antennas 120-1, 120-2, 130-1, recited in paragraph 0021**).

Li et al. teaches all the subject matter of the claimed invention with the exception of being silent with regard to the following features: wherein said legacy preamble is an 802.11a/g preamble.

However, Liu et al (US 2004/0208115 A1). in the same field of endeavor discloses the legacy preamble (fig. 6, Preamble of Transmitter, recited in paragraph 0062) is an 802.11a/g preamble ("IEE Standard 802.11a/g", fig. 6, "Transmitter Preamble" recited in paragraph 0062), **regarding claim 19**, the legacy preamble (fig. 6, Preamble of Transmitter, recited in paragraphs 0032, 0062) is an 802.11a/g preamble ("IEE Standards802.11a/g", recited in paragraphs 0032, 0062). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to

modify the features of Li et al in order to incorporate the IEEE standards 802.11a/g disclosed by Liu et al. in order to achieve maximum data transmission rate (See Paragraphs 0009-0011 for motivation).

8. **Claim 28** is rejected under 35 U.S.C. 103(a) as being unpatentable over Ma et al (US 2003/0072255 A1) in view of Liu et al (US 2004/0208115 A1).

Regarding claim 28, Ma et al. discloses the method as described in above paragraph. Ma et al. is silent with respect to the following features: the indication is transmitted in a signal field that complies with the 802.11a/g standards.

However, Liu et al (US 2004/0208115). in the same field of endeavor discloses the indication is transmitted in a signal field (fig. 6, Signal Filed, recited in paragraphs 0032, 0062) that complies with the 802.11a/g standards ("IEE Standards 802.11a/g", recited in paragraphs 0032, 0062). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the features of Ma et al in order to incorporate the IEEE standards 802.11a/g disclosed by Liu et al. in order to achieve maximum data transmission rate (See paragraphs 009-0011 for motivation).

9. **Claim 27** is rejected under 35 U.S.C. 103(a) as being unpatentable over Ma et al (US 2003/0072255 A1) in view of Mody et al (US 7,269,127 B2).

Regarding claim 27, Ma et al. discloses the method as described in above paragraphs.

Ma et al. is silent with respect to the following features: wherein said method is performed by a SISO receiver.

However, Mody et al (US 7,269,127 B2). in a similar field of endeavor discloses the following features: a SISO receiver (fig. 1, SISO receiver antenna 16, recited in col. 3, lines 40-54). Therefore, it would have been obvious ton one of ordinary skill in the art at the time the invention was made to modify the features of Ma et al. by incorporating the SISO receiver technique as taught by Mody et al. in order to provide a wider range of diversity (See col. 3, lines 21-39 for motivation).

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Murphy et al (US 7,023,245 B1), Li et al (US 7,272,108 B2), Stuber et al (US 2003/0076777 A1), Wallace et al (US 2002/0193146 A1), and Walton et al (US 2004/0081131 A1).

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Candal Elpenord whose telephone number is (571) 270-3123. The examiner can normally be reached on Monday through Friday 7:30AM to 5:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kwang Bin Yao can be reached on (571) 272-3182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

CE

KWANG BIN YAO
SUPERVISORY PATENT EXAMINER